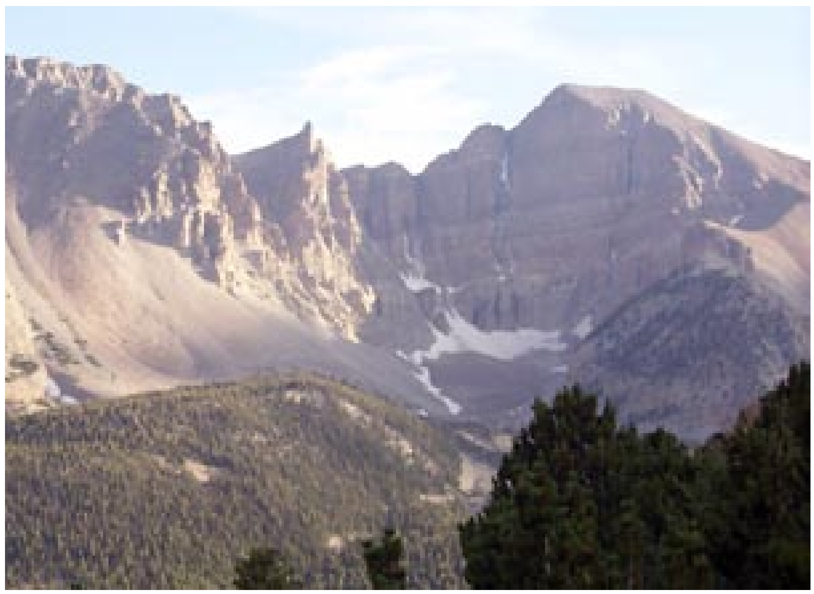
Chapter 31

Great Basin National Park

Great Basin is Nevada's only National Park (except for a small section of Death Valley National Park in southern Nevada). It was established in 1986. Actually, the area of Lehman Caves was established as a National Monument in 1922 and much of the area that presently includes Great Basin National Park was protected as part of the Wheeler Peak Scenic Area of the Humboldt National Forest (http://www.great.basin.national-park.com/info.htm).

Water has been an important factor in the creation of many features at Great Basin National Park. Possibly the most prominent feature at the park is Lehman Caves. The spectacular features in the caves are a product of the interaction of water and geology. Many of the erosional and depositional features viewed around the park were created by glaciation, as ice scoured, transported and deposited rock material. Streams and springs in the Park provide habitat for various plants and animals, and have helped shape the topography of the area. Precipitation that occurs in the high elevations of the Park provides water to support pine and juniper forests and a variety of ground vegetation.



Great Basin National Park. Photograph by D.E. Prudic, USGS.

The first modern resident in the area to find and make public the existence of the cave was Absalom Lehman in about 1885. Ab Lehman opened up the cave to tourists and added wooden structures such as ladders to make the cave more accessible. Archeological evidence shows that Native Americans accessed the caves and used the caves as a burial place as early as 800 years ago. (http://www.great.basin.national-park.com/info.htm).

In order to discuss the hydrology of Lehman Caves, one must first discuss how caves are formed. Karst is the geologic term typically used to describe features such as caves, caverns, and solution pits, where rock material has been dissolved away to form these openings. Karst features typically form in limestone because this rock type dissolves readily when in contact with acids (and over time when in contact with slightly acidic water), but can also form in other rock types such as dolomite, salts (halite, gypsum, and others) and marble (which is metamorphized limestone).

Many field geologists carry a small bottle of dilute hydrochloric acid (HCl) with them for testing for limestone (calcium carbonate) in rock samples. When the HCl is put on limestone, there is a reaction where the solution bubbles and fizzes. It is a similar reaction when you place a drop of vinegar on some baking soda. The HCl reacts with the rock and lets off gases (bubbles) and dissolves some of the rock surface.

This same type of reaction happens naturally when water on the land surface percolates down into limestone rocks. The surface water contains dissolved carbon dioxide from the atmosphere and from the soils. This dissolved carbon dioxide makes the water slightly acidic (carbonic acid). The water then percolates down to the water table where it can dissolve the limestone bedrock over many thousands or millions of years (in geologic time, this is a rapid occurrence, but in human time, karst formation can be a very slow process, depending on the acidity of the water and the rock type). As the bedrock dissolves, caves are formed.

For a very good description and a more in-depth discussion of cave forming processes, please look at the Great Basin Nation Park web site at http://www.great.basin.national-park.com/hike.htm.

If Lehman Caves are in the range of hundreds of thousands to millions of years old, this implies that the water table relative to this location was much higher in the geologic past because much of the cave is dry. This change in the water level could be the result of various processes, such as climate change (during the Pleistocene, or Ice Age, ending about 8,000 to 10,000 years ago, many of the basins in Nevada were covered by large lakes), uplift of the mountains, or erosion by mountain streams causing a decline in groundwater levels. Whatever the cause, the drop in the water table resulted in Lehman Caves being mainly dry and accessible for walking tours.

Lehman Caves has an extensive concentration of speleothems (cave formations or decorations) which form from the deposition of calcium carbonate (limestone) carried by water dripping and splashing into the cave. Speleothems in Lehman Cave include stalactites (elongated features hanging from the ceiling), stalagmites (elongated features rising up from the floor), columns (typically connected stalactites and stalagmites), soda straws, draperies, including a feature known as cave bacon, flowstones, cave popcorn, and shields. Shields are fascinating features that look like two disks or circular plates cemented together. Lehman Cave has over 300 shields and is known for these features (http://www.nps.gov/grba/lehmancaves.htm).

Glaciation at Great Basin National Park has had a dominant effect on shaping the area's topography. Glaciers are masses of ice and snow that remain from year to year and move downslope because of gravity. In the past, many glaciers covered parts of Great Basin National Park, and today the park has Nevada's only glacier.

Speleothems in Lehman Caves.

Glaciers can shape the topography by both erosion and deposition. Often, glaciers will scour out bowls (referred to as cirques) which may later fill with water and become mountain lakes. Glaciers can erode out U-shaped valleys and can transport much sediment down the mountains. Likewise, glaciers can alter the topography by depositing huge hills and ridges of sediment known as moraines. Many of the long ridges and hills in the park are moraines resulting from glacial deposition.

Water action by precipitation and runoff also has shaped much of the present topography of the park. Erosion from rainfall and snowmelt has weathered and transported sediment downslope from the mountains. Water that gets into cracks and openings in the rock and then freezes (and expands) can cause rocks to break apart. Streams can erode into the land surface and can transport and deposit sediment along their paths. All of these processes have had an impact on shaping the face of Great Basin National Park.

The USGS, in cooperation with the NPS, has completed a study of the susceptibility of water resources in Great Basin National Park. The purpose of the study was to determine areas within Great Basin National Park where the water resources (springs and streams) could be affected by ground-water withdrawals from the adjacent valleys. In addition, the study quantified the discharge of major streams and springs within the Park, assessed the natural variability of their flow.

As part of this study, eleven stream gages were installed to monitor discharge of springs and streams for a two-year period. The gains and losses in streamflow were correlated to the geology along six streams to determine areas susceptible to ground-water withdrawals in adjacent basins.

The report of the study results has been prepared and, at the time of this book, is in internal review with the USGS. Once available, the report can be accessed electronically through the USGS web site at <http://nevada.usgs.gov>.

Great Basin National Park has been greatly shaped and influenced by various water processes. In addition to natural conditions and variations, human impacts also may affect the hydrology of the Park. The Park is a good example of the importance of water in shaping the geologic features, topography, and future changes in Nevada.

USGS hydrologists, Peggy Elliott and Dave Beck, measuring discharge at Great Basin National Park.